

## Technical Reference Model

Element ID	Element Name	Element Description
TRM	Technical Reference Model (TRM)	Provides a foundation to categorize the standards, specifications, and technologies to support the construction, delivery, and exchange of business and application components (Service Components) that may be used and leveraged in a Component-Based or Service-Oriented Architecture. The TRM unifies existing Agency TRMs and E-Gov guidance by providing a foundation to advance the re-use of technology and component services from a government-wide perspective.
1	Component Framework	The Component Framework Area defines the underlying foundation and technical elements by which Service Components are built, integrated and deployed across Component-Based and Distributed Architectures. The Component Framework consists of the design of application or system software that incorporates interfaces for interacting with other programs and for future flexibility and expandability. This includes, but is not limited to, modules that are designed to interoperate with each other at runtime.
1.1	Business Logic	Defines the software, protocol or method in which business rules are enforced within applications.
1.1.890	Platform Independent Technologies	Consists of all software languages able to execute and run on any type of operating system or platform.
1.1.891	Platform Dependent Technologies	Consists of the programming languages and methods for developing software on a specific operating system or platform.
1.2	Data Interchange	Data Interchange define the methods data is transferred and represented in and between software applications.
1.2.892	Data Exchange	Data Exchange is concerned with the sending of data over a communications network and the definition of data communicated from one application to another. Data Exchange provides the communications common denominator between disparate systems.
1.3	Data Management	Data management is the management of all data/information in an organization. It includes data administration, the standards for defining data and the way in which people perceive and use it.
1.3.893	Database Connectivity	Defines the protocol or method in which an application connects to a data store or data base.
1.3.894	Reporting and Analysis	Consist of the tools, languages and protocols used to extract data from a data store and process it into useful information.
1.4	User Presentation / Interface	This defines the connection between the user and the software, consisting of the presentation that is physically represented on the screen.
1.4.886	Static Display	Static Display consists of the software protocols that are used to create a predefined, unchanging graphical interface between the user and the software.

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1.4.887	Dynamic / Server-Side Display	This consists of the software that is used to create graphical user interfaces with the ability to change while the program is running.
1.4.888	Content Rendering	This defines the software and protocols used for transforming data for presentation in a graphical user interface.
1.4.889	Wireless / Mobile / Voice	Consists of the software and protocols used for wireless and voice enabled presentation devices.
1.5	Security	Security defines the methods of protecting information and information systems from unauthorized access, use, disclosure, disruption, modification, or destruction in order to provide integrity, confidentiality and availability. Biometrics, two factor identification, encryption, and technologies based on the NIST FIPS-140 standards are evolving areas of focus.
1.5.884	Certificates / Digital Signatures	Software used by a certification authority (CA) to issue digital certificates and secure access to information. The evolution of Public Key Infrastructure (PKI) is based on the verification and authentication of the parties involved in information exchange.
1.5.885	Supporting Security Services	These consist of the different protocols and components to be used in addition to certificates and digital signatures.
2	Service Access and Delivery	Service Access and Delivery defines the collection of Access and Delivery Channels that will be used to leverage the Service Component, and the legislative requirements that govern its use and interaction.
2.6	Access Channels	Access Channels define the interface between an application and its users, whether it is a browser, personal digital assistant or other medium.
2.6.850	Web Browser	Define the program that serves as your front end to the World Wide Web on the Internet. In order to view a site, you type its address (URL) into the browser's location field.
2.6.851	Wireless / PDA	Define the technologies that use transmission via the airwaves. Personal Digital Assistant (PDA) is a handheld computer that serves as an organizer for personal information. It generally includes, at a minimum, a name and address database, to-do list and note taker.
2.6.852	Collaboration / Communications	Define the forms of electronic exchange of messages, documents, or other information. Electronic communication provides efficiency through expedited time of delivery.
2.6.853	Other Electronic Channels	Define the other various mediums of information exchange and interface between a user and an application.
2.7	Delivery Channels	Delivery channels define the level of access to applications and systems based upon the type of network used to deliver them.
2.7.854	Internet	The Internet is a worldwide system of computer networks in which users at any one computer can, if they have permission, get information from any other computer.

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2.7.855	Intranet	An Intranet is a private network that is contained within an enterprise. It may consist of many interlinked local area networks and is used to share company information and resources among employees.
2.7.856	Extranet	An Extranet is a private network that uses the Internet protocol and the public telecommunication system to securely share part of a business's information or operations with suppliers, vendors, partners, customers, or other businesses. An extranet can be viewed as part of a company's intranet that is extended to users outside the company.
2.7.857	Peer to Peer (P2P)	Peer to Peer is a class of applications that operate outside the DNS system, have significant or total autonomy from central servers, and take advantage of resources available on the Internet.
2.7.858	Virtual Private Network (VPN)	A private data network that makes use of the public telecommunication infrastructure, maintaining privacy through the use of a tunneling protocol and security procedures.
2.8	Service Requirements	Service Requirements define the necessary aspects of an application, system or service to include legislative, performance, and hosting.
2.8.859	Legislative / Compliance	Defines the prerequisites that an application, system or service must have mandated by congress or governing bodies.
2.8.860	Authentication / Single Sign-on (SSO)	Refers to a method that provides users with the ability to login one time, getting authenticated access to all their applications and resources.
2.8.861	Hosting	Refers to the service provider who manages and provides availability to a web site or application, often bound to a Service Level Agreement (SLA). The Hosting entity generally maintains a server farm with network support, power backup, fault tolerance, load-balancing, and storage backup.
2.9	Service Transport	Service Transport defines the end to end management of the communications session to include the access and delivery protocols.
2.9.862	Supporting Network Services	These consist of the protocols that define the format and structure of data and information that is either accessed from a directory or exchanged through communications.
2.9.863	Service Transport	These consist of the protocols that define the format and structure of data and information that is either accessed from a directory or exchanged through communications.
3	Service Interface and Integration	The Service Interface and Integration Area defines the discovery, interaction and communication technologies joining disparate systems and information providers. SOAs leverage and incorporate Service Interface and Integration standards to provide interoperability and scalability.

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3.10	Integration	Integration defines the software services enabling elements of distributed business applications to interoperate. These elements can share function, content, and communications across heterogeneous computing environments. In particular, service integration offers a set of architecture services such as platform and service location transparency, transaction management, basic messaging between two points, and guaranteed message delivery.
3.10.895	Middleware	Middleware increases the flexibility, interoperability, and portability of existing infrastructure by linking or "gluing" two otherwise separate applications.
3.10.896	Enterprise Application Integration	Refers to the processes and tools specializing in updating and consolidating applications and data within an enterprise. EAI focuses on leveraging existing legacy applications and data sources so that enterprises can add and migrate to current technologies.
3.11	Interface	Interface defines the capabilities of communicating, transporting and exchanging information through a common dialog or method. Delivery Channels provide the information to reach the intended destination, whereas Interfaces allow the interaction to occur based on a predetermined framework.
3.11.900	Service Discovery	Defines the method in which applications, systems or web services are registered and discovered.
3.11.901	Service Description / Interface	Defines the method for publishing the way in which web services or applications can be used.
3.12	Interoperability	Interoperability defines the capabilities of discovering and sharing data and services across disparate systems and vendors.
3.12.897	Data Format / Classification	Defines the structure of a file. There are hundreds of formats, and every application has many different variations (database, word processing, graphics, executable program, etc.). Each format defines its own layout of the data. The file format for text is the simplest.
3.12.898	Data Types / Validation	Refers to specifications used in identifying and affirming common structures and processing rules. This technique is referenced and abstracted from the content document or source data.
3.12.899	Data Transformation	Data Transformation consists of the protocols and languages that change the presentation of data within a graphical user interface or application.
4	Service Platform and Infrastructure	The Service Platform and Infrastructure Area defines the collection of platforms, hardware and infrastructure specifications that enable Component Based Architectures and Service Component reuse.
4.13	Database / Storage	Database / Storage refers to a collection of programs that enables storage, modification, and extraction of information from a database, and various techniques and devices for storing large amounts of data.

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4.13.875	Database	Refers to a collection of information organized in such a way that a computer program can quickly select desired pieces of data. A database management system (DBMS) is a software application providing management, administration, performance, and analysis tools for databases.
4.13.876	Storage	Storage devices are designed to provide shared storage access across a network. These devices provide extended storage capabilities to the network with reduced costs compared to traditional file servers.
4.14	Delivery Servers	Delivery Servers are front-end platforms that provide information to a requesting application. It includes the hardware, operating system, server software, and networking protocols.
4.14.871	Web Servers	A computer that provides World Wide Web services on the Internet. It includes the hardware, operating system, web server software, TCP/IP protocols and the web site content (web pages). If the web server is used internally and not by the public, it may be known as an "intranet server".
4.14.872	Media Servers	Provide optimized management of media based files such as audio and video streams and digital images.
4.14.873	Application Servers	In a three-tier environment, a separate computer (application server) performs the business logic, although some part may still be handled by the user's machine. After the Web exploded in the mid 1990s, application servers became Web based.
4.14.874	Portal Servers	Portals represent focus points for interaction, providing integration and single-source corporate information.
4.15	Hardware / Infrastructure	Defines the physical devices, facilities and standards providing the computing and networking within and between enterprises.
4.15.877	Servers / Computers	This refers to the various types of programmable machines which are capable of responding to sets of instructions and executing programs.
4.15.878	Embedded Technology Devices	This refers to the various devices and parts that make up a Server or Computer as well as devices that perform specific functionality outside of a Server or Computer.
4.15.879	Peripherals	Computer devices that are not part of the essential computer (i.e. the memory and microprocessor). Peripheral devices can be external and internal.
4.15.880	Wide Area Network (WAN)	A data network typically extending a LAN outside a building or beyond a campus. Typically created by using bridges or routers to connect geographically separated LANs. WANs include commercial or educational dialup networks such as CompuServe, InterNet and BITNET.
4.15.881	Local Area Network (LAN)	A network that interconnects devices over a geographically small area, typically in one building or a part of a building. The most popular LAN type is Ethernet. LANs allow the sharing of resources and the exchange of both video and data.

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4.15.882	Network Devices / Standards	A group of stations (computers, telephones, or other devices) connected by communications facilities for exchanging information. Connection can be permanent, via cable, or temporary, through telephone or other communications links. The transmission medium can be physical (i.e. fiber optic cable) or wireless (i.e. satellite).
4.15.883	Video Conferencing	Communication across long distances with video and audio content that may also include graphics and data exchange. Digital video transmission systems typically consist of camera, codec (coder-decoder), network access equipment, network, and audio system.
4.16	Software Engineering	Software engineering covers the technology associated with building software systems as well as technical solutions supporting management issues, such as testing, modeling and versioning. The TRM is concerned with component technical architecture, not engineering processes.
4.16.867	Integrated Development Environment (IDE)	This consists of the hardware, software and supporting services that facilitate the development of software applications and systems.
4.16.868	Software Configuration Management	Technology applicable to all aspects of software development from design to delivery specifically focused on the control of all work products and artifacts generated during the development process. Several technical solutions on the market provide the integration of the software configuration management functions.
4.16.869	Test Management	Technology which supports the consolidation of all testing activities and results. Test Management activities include test planning, designing (test cases), execution, reporting, code coverage, and heuristic and harness development.
4.16.870	Modeling	Technology that supports the process of representing entities, data, business logic, and capabilities for aiding in software engineering.
4.17	Support Platforms	Support platforms are hardware or software architectures. The term originally dealt with only hardware, and it is still used to refer to a CPU model or computer family.
4.17.864	Wireless / Mobile	Radio transmission via the airwaves. Various communications techniques are used to provide wireless transmission including infrared "line of sight", cellular, microwave, satellite, packet radio and spread spectrum.
4.17.865	Independent Platform	Defines the operating systems and programming languages able to execute and run on any platform or operating system. A platform is the underlying hardware and software comprising a system.
4.17.866	Dependent Platform	Defines the operating systems and programming languages able to execute and run on a specific platform or operating system. A platform is the underlying hardware and software comprising a system.